

**EVALUATION OF ADEQUACY OF MANAGEMENT OF CARDIAC DISEASE IN  
PREGNANCY AT KENYATTA NATIONAL HOSPITAL**

**A RETROSPECTIVE COHORT STUDY**

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**DECLARATION**

This is a declaration that this dissertation is my original work, carried out with guidance of my supervisors, and references made to work done by others have been indicated.

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## Dedication

To John, Austin and Adiel. For the unconditional love, support and a warm home.

## **List of abbreviations**

ACOG	American Congress of Obstetricians and Gynaecologists
CHD	Congenital heart disease.
CO	Cardiac output
ESC	European Society of cardiology
MBRRACE-UK	Mother and Babies: Reducing risk through Audits and Confidential Enquiries across the UK
MDT	Multidisciplinary Team approach
MOH	Ministry of Health
MS	Mitral stenosis.
NICE	National Institute for Health and Care Excellence
NYHA	New York Heart Association.
PPH	Post-partum haemorrhage
RCOG	Royal College of Obstetricians and Gynaecologists
RHD	Rheumatic heart Disease
SOP	Standard Operating Procedure
UON	University of Nairobi
WHO	World Health Organisation
KNH	Kenyatta National Hospital.

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## ABSTRACT

**Background-**Heart disease is a significant cause of maternal morbidity and mortality. It complicates 1 – 4% of pregnancies, in which tolerance of the heart to the essential cardiovascular changes is hampered, resulting in an increased risk to decompensate. This increases the risk of severe morbidity and mortality. Management of cardiac disease in pregnancy ought to be from a multidisciplinary approach. Adequate and effective management of these patients from preconception care to post-partum period reduces both maternal and early neonatal morbidity and mortality. This study is an evaluation of the care given to patients with cardiac disease in pregnancy at Kenyatta National Hospital. **Justification** The burden of heart disease in pregnancy is high especially in low and middle-income countries. It accounts for about 80% of the indirect causes of maternal mortality. The incidence of heart disease in pregnancy is likely to increase as predisposing factors such as NCDs are on the rise and more children with congenital or rheumatic heart disease are reaching child bearing age. Multidisciplinary approach in care would enhance better management and decision making hence improve both the maternal and neonatal outcomes. Despite cardiac disease in pregnancy being relatively common, research interest in this area has been low. There is a definite need for well-defined standards of care, a hiatus that needs careful research and recommendation. This study will help to describe the current practice in the management of cardiac disease in pregnancy at Kenyatta National Hospital and generate baseline data from which future research can be done. **Objectives:** To evaluate the adequacy of management of patients with cardiac disease in pregnancy at Kenyatta National Hospital over the last 10 years. Specifically, evaluate the provision of preconception care, objective prenatal care, determine the adequacy of intrapartum and post-delivery management of patients with heart disease in pregnancy.

**Methods** –A descriptive retrospective cohort study in which 72 records of patients with heart disease in pregnancy who received care at Kenyatta National Hospital from 31<sup>st</sup> December 2017 were reviewed, retrospectively until a sample size was reached. **Results:** The mean age of the participants was 29.6 years (SD 7.1). A majority of the patients (76.4%) were multigravida. The preponderant NYHA classifications were NYHA IV in 19 (26.4%) participants and NYHA III in 12 (16.7%). Most 71 (98.6%) participants attended at least one ANC session with 29 (41.4%) participants attending 4 or more ANC sessions (Table 4). Seventy (97.2%) patients were referrals. Only 22.2% of patients received antenatal cardiologist review antenatally, while 51% of the patients had a cardiologist review in the postnatal period. None of the patients had a joint multidisciplinary conference. Most patients 48(66.7%) delivered vaginally. In the postnatal period, almost all the patients 71.0(98.8%) had monitoring of vital signs post-delivery, but only 16.0(22.2%) had a documented education on danger signs.

**Conclusion:** The antenatal review of patients with cardiac disease in pregnancy and the joint interdisciplinary conference with patients is grossly lacking at Kenyatta National Hospital. There is good monitoring of patients' vital signs post-delivery with well documented post-delivery follow up plans but education on danger signs post admission was inadequate.

**Keywords-** Cardiac disease, pregnancy, adequacy, multidisciplinary approach.

## **Chapter 1: INTRODUCTION**

Heart disease complicates 0.2 – 4% of pregnancies(1,2). It is an increasingly significant cause of maternal morbidity and mortality(3). Cardiovascular changes that occur in pregnancy can easily topple over an already compromised heart into decompensation. Pre-existing cardiac disease that is not well managed may set out cascades of events that often end up in adverse maternal and neonatal outcomes.

Causes of heart disease include rheumatic heart disease, congenital heart disease, ischemic heart disease, hypertensive heart disease and peripartum cardiomyopathy.

Pregnancy has a significant effect on the circulatory system. Usually, the hemodynamic changes start in the first trimester, peak during the second trimester and then remain unchanged in the third trimester(4). These changes then resolve mostly within 6 weeks postpartum(5–9)

The developed countries grapple more with congenital heart disease.(5,10) They are also increasingly dealing with ischemic and hypertensive heart disease due the rise in risk factors associated with cardiovascular such as diabetes, hypertension and obesity in their populace as well as an increasing age at first pregnancy(2). The medical and surgical management of congenital heart disease has also markedly improved over time, resulting in more women with heart disease getting to child bearing age(2).

The management and follow up of patients with known heart disease should be instituted in the preconception period. On conception, the patient should be managed by a multidisciplinary team. The postpartum period is a most critical time for most patients with heart disease in pregnancy as a significant amount of complications tend to arise during this time(11).

There is a big gap between what is recommended and what is done in daily practice. This study aims to evaluate care and bring out gaps in the everyday management of patients with heart disease in pregnancy.

## **Chapter 2: LITERATURE REVIEW**

As indirect causes of maternal deaths, non-obstetrical pre-existing conditions, account for over a quarter (28%) of global maternal mortality (12). Recent studies have suggested that maternal deaths attributable to indirect causes are on the rise (12,13) and that the greatest burden is shouldered by the world's poorest women, living in Southeast Asia and sub-Saharan Africa (12). Despite this significant and increasing burden, there has been a lack of global attention on understanding and addressing non-obstetrical drivers of poor pregnancy outcomes (14). There has been an increase in indirect cause of maternal mortality, but not much attention has been given to understanding the exact causes, what their contribution to maternal mortality is and how to remedy the situation. In part, this inattention is due to the multiple factors associated with indirect maternal mortality, which include a diverse set of pre-existing conditions such as HIV, anaemia, mental health conditions and cardiovascular disease.

More women with preexisting medical conditions are reaching reproductive age due to improved diagnostic and therapeutic modalities. There is also a rise in the incidence of noncommunicable diseases such as hypertension, diabetes and chronic kidney diseases. These coupled with the tendency to delay child bearing has contributed to an increase indirect maternal mortality. Noncommunicable diseases are a well-recognized prerequisite to development of cardiac disease.

The success in both medical and surgical management of congenital heart disease has led to an increase in women at child bearing age presenting with problems of treated congenital heart disease (15,16), hence the need to improve care in order to minimize adverse maternal and neonatal outcomes and to optimize the care to the unborn baby and the mother. (2,17). This has not been the case especially in most resource poor settings like sub-Saharan Africa.

Minimal data exists on audits of management of patients with heart disease in pregnancy. There is also paucity of clear guidelines in these resource poor settings.

Cardiac disease is of particular concern because it is an important cause of maternal morbidity and mortality (11). It complicates approximately 0.2 - 4% of pregnancies (2,18). The risk of death in pregnant women with congenital heart disease is about 1% which is approximately 100 times higher than the baseline risk for maternal mortality in the developed world. (19)

Pregnancy puts a lot of demand on the cardiovascular system. This often worsens any previously known cardiac disease and may cause mild heart disorders to become symptomatic for the first time during a pregnancy (4).

The increased demand on function results from decreased hemoglobin levels and increased blood volume, stroke volume and heart rate. Cardiac output is said to increase by 30 - 50%. These changes tend to reach a peak at 28 - 34 weeks gestation (4).

Cardiac output increases by 20% during labour with each uterine contraction. Bearing down during the 2nd stage of labour and an increase in venous return to the heart are some of the other major stresses on the heart. Cardiovascular function does not return to pre pregnancy levels until several weeks after pregnancy(4).

The New York Heart Association Classification provides an easy way of categorizing the level of heart failure according to limitation meted on physical activity. These symptoms are based on normal breathing and varying degrees of shortness of breath and chest pain.

There are four main categories. These include NYHA I – No symptoms and no limitation in daily activity like climbing stairs or walking. NYHA II- Some shortness of breath and slight limitation in daily activity. NYHA III-Marked limitation in activity due to seven during less than ordinary activity like walking short distances. Comfortable only at rest. NYHA III- Severe limitation in physical activity. Experiences symptoms even at rest.

Maternal mortality ranges from 0.4% among patients in NYHC I and II to 6.8% amongst those in NYHC III and IV. These cardiovascular deaths are preventable to a large extent through early detection, aggressive management and close follow-up (20).

Cardiac disease in pregnancy can be caused by congenital or acquired causes. In a report from the European Registry on Heart Disease which involved the biggest published group of women with pregnancy complicated by cardiac disease, 1321 pregnant women were enrolled for the registry. Out of these, 66% had congenital heart disease. One third of those women had shunt lesions such as ventricular or atrial septal defects and the rest had multiple lesions, including mitral and pulmonary valve abnormalities, aortic coarctation, transposition of the great arteries and Marfan's Syndrome.(21)(19) In a Canadian study of 405 pregnancies in women with congenital heart disease more than half of them had shunt lesions, repaired tetralogy of Fallot or

aortic coarctation(19). This is in contrast to the situation in the developed world where the commonest cause of heart disease in pregnancy is rheumatic heart disease. There is therefore need to encourage more research on comprehensive management of cardiac disease in pregnancy in Sub Saharan Africa.

From a global scale, cardiac disease had been cited as a leading cause of indirect maternal death. Incipient cardiac disease had been shown to account for about one in six maternal deaths (22). In the United Kingdom, it accounted for about 16.5 % of all pregnantmothers' deaths in a period between 1997-1999.(22). From the above report, three of the audited deaths (3 out of 35) were traced to deviation from standard practice and care. It is difficult and complex to determine less than standard care but it is usually tied around failed communication among members of the multidisciplinary teams, lack of clear guidelines for the management of cardiac problems and failure of individual clinicians to recognize and diagnose cardiac problems accurately or to appreciate the severity of the condition at hand. (22). This calls for clearer guidelines and standard operating procedures that will aid in better management of patients with cardiac disease in pregnancy. There haven't been any large-scale studies in sub-Saharan Africa or registries for cardiac disease in pregnancy.

One UK confidential report found that of the 910 maternal deaths between 2009 and 2014, 205(22.5%) were caused by heart disease with a small percentage being from congenital heart disease (19).

Over the last several years, new cases of acute coronary events during pregnancy has increased due to older child bearing age, changes in lifestyle which come are associated diseases such as hypertension, smoking and obesity in women (21)

From a regional perspective, a study done in Dakar, Senegal showed significant maternal mortality of 17 (34%) out of 50 patients with valvular heart disease who had been followed up over a period of 8 years (23). The sample size appears to be a small one compared to the study period. The study did not report on the care given to the patients with cardiac disease in pregnancy at any stage of the pregnancy. It only concentrated on the fetal and maternal outcomes of the participants. Another study done in Khartoum Hospital; Sudan showed a maternal

mortality of 2.7% out of the 75 patients who were being followed up (18). This study only reported the outcomes in patients with cardiac disease in pregnancy. This is in contrast to an audit on management of patients with cardiac disease done in Pretoria, South Africa which showed a morbidity rate of 11.6% and a case fatality rate of 3.3%. this was out of 189 cases studied retrospectively (24). The study did not look at whether preconception care was given to the patients and the kind of antenatal, intrapartum and postnatal offered to the patients.

The landscape on Kenya's burden of disease has historically been focused on communicable diseases. However, recent studies have shown a large and fast increase in the prevalence of non-communicable diseases such as cancers and cardiovascular diseases. This can be attributed to a shift in life styles of Kenyans from a more physically active lifestyle with predominantly traditional foods to a more sedentary one with increased intake of fast foods (25). The increase in incidence of non-communicable diseases means that more women with or at risk of getting cardiovascular disease will get to childbearing age.

Women with cardiac disease are classified as 'high risk' as a result of the increased risk of poorer outcomes for them and for their infants. For the unborn babies, this includes a higher risk of fetal malformations especially in women with congenital heart disease, premature birth, low infant birth weight, admission to neonatal intensive care unit and infant death (15,17). Furthermore, the mothers are at increased risk of developing acute cardiac failure, arrhythmias, admission into ICU and maternal death most commonly from cardiomyopathy and pulmonary hypertension (17)

In the developed countries such as the UK, NICE guideline recommends that women with additional care needs like those with cardiac disease should be triaged at the antenatal booking clinic. However, the guidelines are usually for routine care of healthy women. This leaves the additional care of pregnant women with preexisting cardiac disease not well described. (17)

The commonest cause of cardiac disease in the low and middle income countries is Rheumatic heart disease which often results in valvular damage. The most common sequel is mitral stenosis and other forms of acquired valvular disease (2,26).

A pregnancy that has been complicated by a valvular heart lesion tends to have a good prognosis if the risks are managed properly. The management of a pregnant woman with heart disease

requires special attention and expertise and such patients especially the ones with high risk conditions should be referred to specialized centers. (27)

Where medical treatment is necessary during pregnancy, the least possible therapeutic doses of the required drugs should be administered. Such drugs as hydralazine, methyldopa, digoxin, adenosine, and procainide can be safely used (27)

It is recommended that women known or suspected to have cardiovascular disease should start counselling before pregnancy. The counselling should include genetic aspects for patients with family history of cardiac disease and congenital heart disease (2). Women with cardiac disease in pregnancy and especially those with high risk lesions should be managed in specialized centers by multidisciplinary teams (2). Diagnostic procedures and cardiac interventions should be performed by specialists with great expertise in the individual techniques and experience in treating pregnant patients (2,28). A multi-disciplinary forum is very useful especially because there are areas of management such as anesthesia that may influence the risk associated with that particular patient. It is very crucial that the care for women with cardiac disease in pregnancy involves regular assessment throughout the pregnancy ideally by the same team or the same person (16). The clinician needs to have a low threshold for ordering investigations and admitting the patients to hospital. This is because sometimes admissions may be appropriate even for vague symptoms (16). This presents as a challenge in developing countries. Partly because of the poor patient health care provider ratios and the fact that most of the developing countries do not have systems in place to carry out such level of care.

Clear and precise documentation of these discussions are necessary and extremely important as they can easily be forgotten or mis interpreted in subsequent events (15) Good documentation also provides rich source of information for future reviews or research and creates seamless avenues for communication between the different healthcare workers involved in the care of the patient.

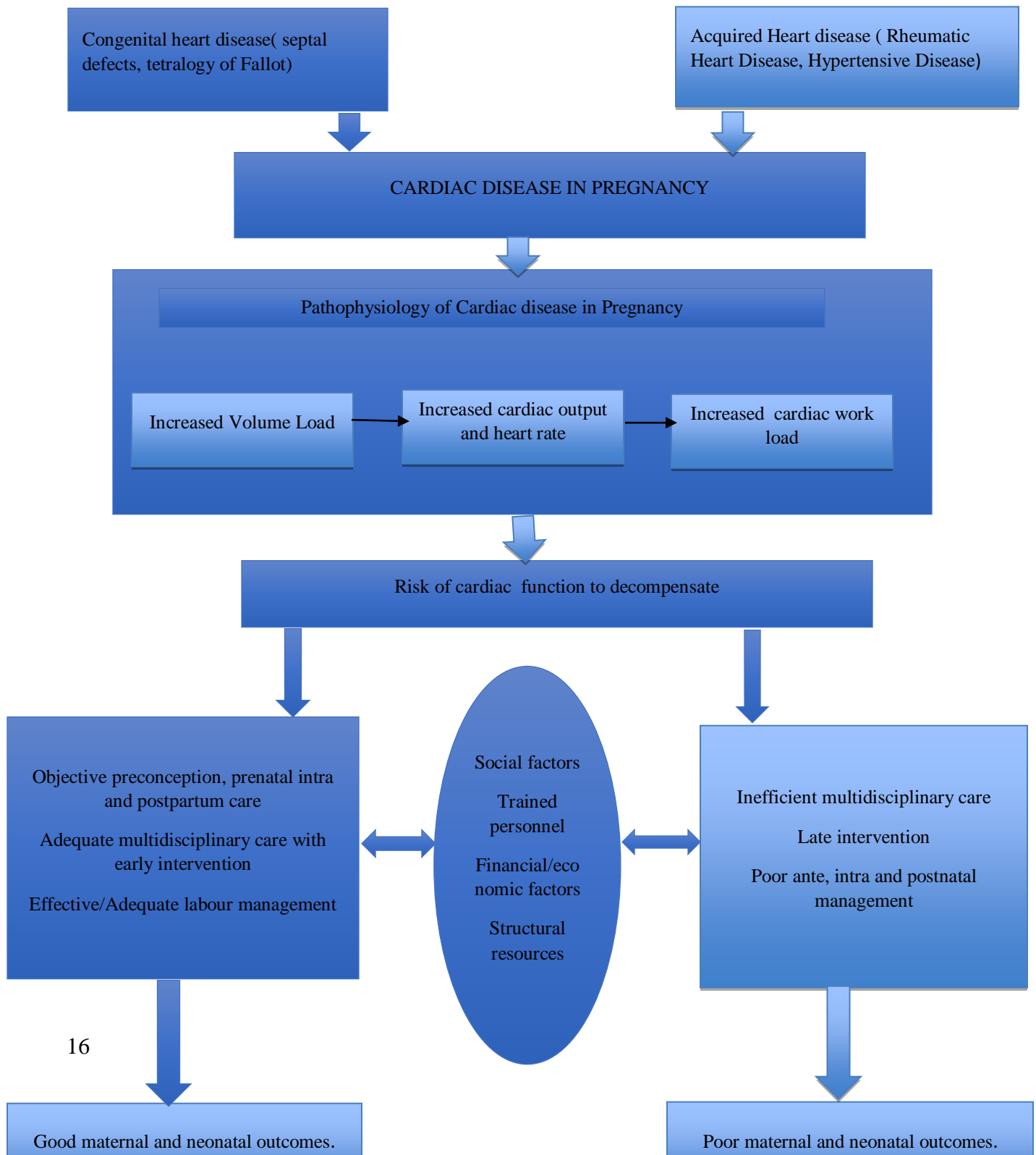
Communication between the patient and her partner, obstetricians, cardiologists, anesthetists, intensivists, cardiac surgeons where applicable and midwives is very vital in order for the correct decisions to be made and plans for a better outcome. Documentation of these communications is also paramount. (15)



Most pregnancies complicated by heart disease result in a favorable outcome for both mother and the baby, provided meticulous care is taken during the antenatal, intra and postnatal period. (29) Heart failure may occur in the pregnant cardiac patient at any time and may progress very rapidly. Therefore, thorough monitoring throughout pregnancy, labor and the puerperium is most essential for early diagnosis and prompt treatment to reduce maternal mortality due to this cause (29).

## 2.1 Conceptual framework

### 2.1.1 Diagrammatic representation



### **2.1.2 Narrative**

The main causes of cardiac disease in pregnancy can be classified into acquired and congenital causes. Rheumatic heart disease forms the majority of acquired causes especially in developing countries.

Pregnancy comes with profound changes in the circulatory system. Some of the main changes are an increase in the blood volume by 30 - 50%, increased heart rate by 10 – 15 beats hence an increase in cardiac output. The blood pressure decreases by 10-15mmgh due to a general decrease in systemic vascular resistance as a result of vasodilation and a low resistance circuit created by the placenta. (4)

These circulatory changes can further compromise an already compromised heart toppling it into heart failure, arrhythmias or any other acute cardiac event.

It is therefore paramount to have appropriate radiological investigations done, give the correct drug therapy and have a multidisciplinary approach to management of cardiac disease in pregnancy early on or immediately cardiac disease is diagnosed. This means involving a cardiologist, an obstetrician with the experience in treating cardiac disease in pregnancy, an anesthesiologist for assessment incase caesarian delivery is recommended and the midwives with experience in dealing with cardiac disease in pregnancy.

This then ensures that optimal care is given to patients with cardiac disease in pregnancy and therefore increase the probability of having good maternal and neonatal outcomes.

## **2.2 Justification**

Cardiac disease in pregnancy is a major cause of indirect maternal mortality. Low and middle income countries like Sub Saharan Africa has one of the highest maternal mortality rates. The maternal mortality ratio globally currently stands at 216 maternal deaths per 100,000 as of 2016. According to the Kenya Health Demographic Survey 2015 report, maternal mortality in Kenya as at 2014 was 316 per 100,000(30). Cardiac disease accounts for approximately 80% of indirect maternal mortality especially in low- and middle-income countries like Kenya.

In Kenya, cardiac disease in pregnancy is mainly due to rheumatic heart disease only occasionally encountering congenital heart disease. This is the situation in most developing countries (11). A study recently done in the Western Kenya showed that there is big burden of cardiac disease in pregnancy in that region.

In cardiac disease, tolerance of the heart to the essential cardiovascular changes in pregnancy is hampered, resulting in an increased risk to decompensate hence developing congestive cardiac failure. This increases the risk of severe morbidity and even mortality.

For the Kenyan woman with cardiac disease, termination of pregnancy is usually not an option due to cultural and mostly religious beliefs but also due to the insatiable desire to participate in species propagation. The modern woman is having to delay childbirth due in pursuit of education and advancement in the corporate world. Advanced age is recognized as a risk factor for development of cardiovascular risk factors such a hypertension

Hence, the Kenyan physician ought to be well endowed in skills and knowledge to be able to care for such a patient as this.

Despite cardiac disease in pregnancy being relatively common, research interest has been low key in this area. This study, therefore seeks to generate baseline data from which research in the future can be done.

Standards of care in this area have not evolved positively and documentation of these standards is lacking. There is a definite need for well-defined standards of care, a hiatus that needs careful research and recommendation.

Multidisciplinary approach in care would enhance better management and decision making hence improve both the maternal and neonatal outcomes. This study will help to describe the current practice in management of cardiac disease in pregnancy and aid in identifying weakness and areas of improvement.

## **2.3 Research Question**

Is the management of patients with cardiac disease in pregnancy at Kenyatta National Hospital, adequate?

## **2.4 Objectives**

### *2.4.1 Broad Objective:*

To evaluate the adequacy of management of patients with cardiac disease in pregnancy at Kenyatta National Hospital.

### *2.4.2 Specific objectives*

Among patient with known cardiac disease in pregnancy in KNH: -

1. Evaluate the provision of preconception care to patients.
2. Evaluate the provision of objective prenatal care.
3. Determine the adequacy of intrapartum care.
4. Determine the adequacy of post-delivery care.

## **2.5 Operational definitions**

### *2.4.1 Adequacy*

In this context adequate care can be defined as care consistent with explicit professional consensus in response to a given condition or set of related needs that reduce the risk of negative outcomes and improve chances of positive outcomes. In this study the condition at hand is cardiac disease in pregnancy.

Royal College of Obstetricians and Gynecologist guidelines and Management of Cardiac Disease Kenya Guidelines will be used to assess provision of the recommended care. When more than or equal to 80% of sampled patient files meet the standards on the guidelines, then care will be considered adequate

### *2.4.2 Objective prenatal care*

Prenatal care encompasses processes of identifying social, behavioral, environmental and physiological risks to a woman's fertility and pregnancy outcomes with the goal of reducing these risks through education counselling and appropriate interventions where necessary. Objective Prenatal care would be specifically tailored to the unique needs of a patient with cardiac disease in pregnancy. With special attention to the cardiovascular and hemodynamic status of the mother, early identification of potential problems and prior planning for delivery and post-delivery periods.

## **2.6 Variables**

*Independent variables* will be sociodemographic characteristics such as age, residence, marital status, obstetric characteristics such as parity, and clinical characteristics such as NYHA.

*Dependent variables* will be adequacy of preconception, antepartum, intrapartum and postnatal care.

## **Chapter 3: STUDY DESIGN AND METHODOLOGY**

### **3.1 Introduction**

Presents the comprehensive methodology that this study will follow. Sections covered include the study design, target population, sample determination, sampling criteria, methods of data collection and analysis. Further, the chapter elaborates on quality assurance techniques and research ethics.

### **3.2 Research design**

This was a retrospective descriptive cohort, in which patients records from 31<sup>st</sup> December 2017 were reviewed retrospectively until the sample size was achieved. This design was fit for the study as there is an element of follow up of patients with similar characteristics (cardiac disease in pregnancy) from the antenatal to the postnatal period.

### **3.3 Study site and setting**

This study was conducted at Kenyatta National Hospital in the obstetrics and gynaecology department. Kenyatta National Hospital is the largest public, tertiary referral hospital in Kenya. It is located in Nairobi, Kenya's capital city. It is the largest public teaching referral hospital catering for patients from all over Kenya and across East and Central Africa. It is affiliated to University of Nairobi, Kenya Medical Training College and other training institutions that attach students to the hospital for training. The hospital has an average bed capacity of 1800. The reproductive department has general antenatal, postnatal, high risk clinics, family welfare clinic, youth clinic, antenatal wards, gynaecology wards and oncology wards. The obstetrics unit has an approximate bed capacity of 145. There are two 24hr maternity theatres situated in the maternity unit and 2 gynecology theatres (one in clinic 66 and one in main theatre where oncology and general gynecology cases are done). There are approximately 10,000 deliveries per year. The obstetrics and gynecology wards are located in the ground and first floors of the hospital. Kenyatta National Hospital is best suited for this study as it serves a wide array of demographically diverse patients and has experts in provision of fetomaternal care. Integration of care for patients with cardiac disease in pregnancy is enabled by the presence of multiple specialties including cardiologists, neonatologists and anesthesiologists. Records of patients treated for cardiac disease in pregnancy were retrieved from the records department at Kenyatta National Hospital. The cardiology unit is located on the first floor of the hospital. The outpatient



clinic are conducted every Tuesday and are located on the ground floor of the hospital. There are about 6 highly trained cardiologists in the hospital who work in collaboration with the other departments in the hospital. \the unit also boast of technologist who conduct critical investigations such as electrocardiograms and echocardiographs in close collaboration with the cardiologists.

### **3.4 Study population.**

The target population for this study was patients admitted with cardiac disease in pregnancy at Kenyatta National Hospital obstetrics and gynecology from Dec 2017 retrospectively until a sample size of 72 was achieved.

### **3.5 Inclusion and Exclusion criteria**

Inclusion criteria

- Records of patients who were admitted with a diagnosis of cardiac disease in pregnancy at the department of obstetrics and gynecology who delivered in KNH between 28 to 42 weeks.

Exclusion criteria

- Any records of a patient with a different diagnosis form the one stated above.
- Patients with cardiac disease in pregnancy but delivered elsewhere.
- Patient with a cardiac disease in pregnancy below the gestation of viability

### **3.6 Sample size**

The study sample size was determined using the Cochran's formula at a precision level of 5% and 95% confidence interval as shown below.

$$n = \frac{Z_{1-\alpha}^2 \times P(1 - P)}{\partial^2}$$

$n$  = Desired sample size when population is > 10,000

$\alpha$ = level of significance (5%)

$Z$  = Standard normal deviate corresponding to 95% confidence level (1.96).

$P$  = target performance for adequate care in mothers with cardiac disease in pregnancy (80%).

$\partial$  = Degree of accuracy desired at 5%

$$n = 246$$

Since the target population is <10,000, the study sample will be proportionally adjusted as follows:

$$nf = \frac{n}{1 + \frac{(n-1)}{N}} \quad \text{Where,}$$

$nf$  is the proportionally adjusted sample size since population is < 10,000

$n$  is the desired sample size when population is greater than 10,000

$N$  is the population (estimated between 0.1-4% of deliveries in KNH during study period = 90)

$$nf = 66$$

After a markup of 10%, the final sample size was 72.

### **3.7 Sampling Technique**

Non probability, purposive sampling was used because cardiac disease in pregnancy is a relatively rare occurrence and all the files were reviewed until sample size was reached.

### **3.8 Sampling Procedure**

Upon approval of the study, patient's records were retrieved from the records department in Kenyatta National Hospital. The principal investigator and two qualified registered clinical officers as research assistants, collected data from all the eligible files based on the inclusion criteria, available from December 31<sup>st</sup> 2017 retrospectively until the sample size was reached.

### **3.9 Methods of data collection**

Data was obtained from the records department at KNH. Relevant information was extracted from the sample files. Information extracted included socio demographic data, clinical status of patient at presentation, cardiac lesion diagnosed, medical management given, laboratory and radiological investigations done and record of multidisciplinary reviews done.

Clinical data was collected from the patients file. Baseline data such as age residence and level of education was collected from the admission form. Obstetric and other medical data collected included parity status, clinical condition at presentation, duration of disease, NYHA functional class, prior cardiac events (heart failure) and comorbid conditions from the admission notes. Prior history of cardiac surgery or intervention was documented. Record of preconception counselling done was documented in cases of rheumatic and congenital heart disease. Imaging, laboratory and medical treatment modalities employed during the antenatal, intrapartum and immediate postnatal period was captured. The mode of delivery and documented rationale for the mode of delivery used was noted. Emphasis was put on the multidisciplinary approach in management of these patients.

### **3.10 Validity and reliability**

Quality control was a continuous process throughout the study to optimize validity and reliability of the findings of the study.

### **3.11 Methods of data analysis**

The patient details were described using sociodemographic, obstetric and medical factors. Data was coded, processed and cleaned off any inconsistencies. Statistical analysis was done using SPSS version 24.

Data collected was entered, coded using Microsoft Excel. It was then cleaned and analyzed using Statistical Package for Social Sciences (SPSS Version 24). Analysis included descriptive statistics such as frequencies, proportions, mean, median and percentages. Findings were presented in the form of text, charts, graphs and tables.

The data collected was grouped into four periods based on the specific objectives namely: Preconception care, antenatal care, intrapartum care and postpartum care. Specific variables under each of the objectives were then described in percentages and proportions. The data was presented in tables, charts and graphs.

### **3.12 Ethical consideration**

Ethical approval was sought from the KNH-UON Ethic and Research committee. Upon approval, consent was sought from the head of records department through the head of Obstetrics and Gynecology services, Kenyatta National Hospital. The information collected was treated

with utmost confidentiality. No patient names were included in the data collection forms or any publications arising from the study. Findings from this study were disseminated to stakeholders and shared with the hospital staff in form of Continuous Medical Education. The investigator will also submit abstract to journal for publication.

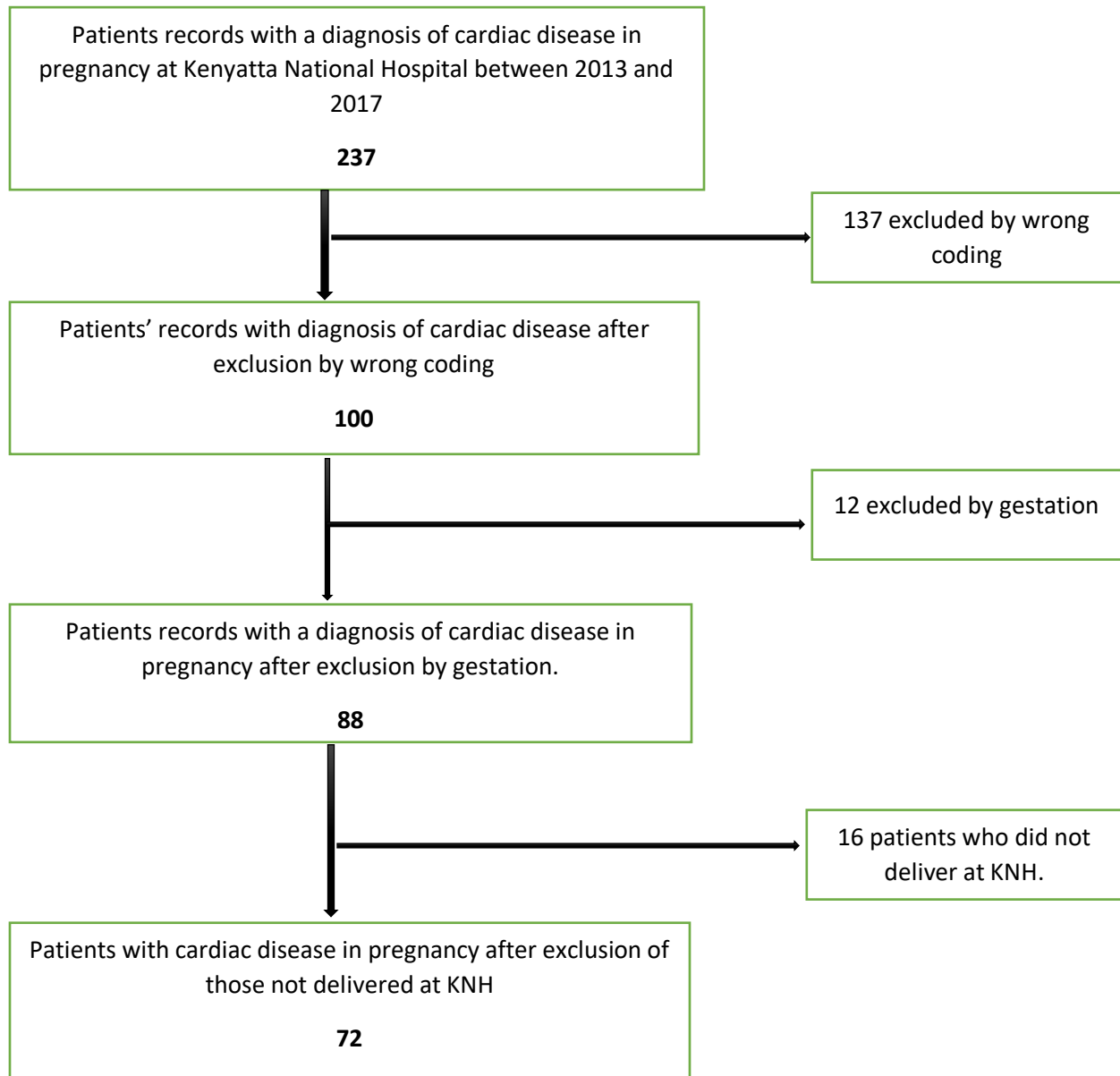
### **3.13 Study Limitations**

Lack of a digital registry from which to retrieve the patient's files which was mitigated by manual retrieval of patients IP numbers from the maternity registry ANC wards, labour ward and postnatal wards at KNH.

Anticipated Incomplete Records from the sampled files was mitigated by exclusion from analysis.

### 3.14 RESULTS

#### STUDY FLOW CHART.



## Characteristics of study participants

A total of 72 patients admitted with cardiac disease in pregnancy between 2013 and 2017 were recruited into the study. The mean age of the participants was 29.6 years (SD 7.1). The modal age group was between 20 and 29 years with 41 (56.9%) participants being in this age group. Most 50 (69.4%) participants were married. There were 28 (38.9%) participants who had attained secondary education and 35(48.6%) of participants resided in peri urban (48.6%) areas.

Table 1: **Sociodemographic characteristics of patients with cardiac disease in pregnancy in KNH(2013 – 2017)**

<b>Characteristic</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<b>Age</b>		
< 20 years	2	2.8
<b>20-29 years</b>	<b>41</b>	<b>56.9</b>
30-30 years	18	25
>40 years	11	15.3
<b>Education level</b>		
Primary	15	20.8
<b>Secondary</b>	<b>28</b>	<b>38.9</b>
Tertiary	15	20.8
Not indicated	14	19.4
<b>Residence</b>		
Urban	8	11.1
<b>Peri urban</b>	<b>35</b>	<b>48.6</b>
Rural	29	40.3
<b>Marital status</b>		
Single	20	27.8
<b>Married</b>	<b>50</b>	<b>69.4</b>
Divorced	1	1.4
Not indicated	1	1.4

## Clinical characteristics of study participants

Out of the 72 patients with cardiac disease in pregnancy 55 (76.4%) were multigravida. There were 65 (90.3%) cases with rheumatic heart disease. The preponderant NYHA classifications were NYHA IV in 19 (26.4%) participants and NYHA III in 12 (16.7%) participants. 29(40.3%) of the patients' files.

Table 2: **Clinical characteristics of patients with cardiac disease in pregnancy in KNH (2013 – 2017)**

<b>Characteristic</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<u>Obstetric</u>		
<i>Parity</i>		
<b>Multigravida</b>	<b>55</b>	<b>76.4</b>
Primigravida	17	23.6
<u>Clinical</u>		
<i>Cardiac lesion</i>		
<b>Rheumatic heart disease</b>	<b>65</b>	<b>90.3</b>
Hypertensive disease	3	4.2
Congenital	4	5.6
<i>Duration of illness in years</i>		
Less than 1 year	14	19.7
1 – 5 years	15	20.8
5 – 10 years	5	6.9
More than 10years	12	16.6
<b>Not documented</b>	<b>26</b>	<b>36.6</b>
<i>NYHA classification</i>		
I	2	2.8
II	10	13.9
III	12	16.7
<b>IV</b>	<b>19</b>	<b>26.4</b>
<b>Not indicated</b>	<b>29</b>	<b>40.3</b>

\*Key : NYHA – New York Heart Association

### Provision of preconception care to patients with known cardiac disease

The three elements of preconception care that were evaluated were risk scoring, contraceptive counselling and cardiac evaluation. None of the participant's files had documented evidence of risk scoring, contraceptive counselling or cardiac evaluation (for those with known cardiac disease) performed

### Provision of objective prenatal care

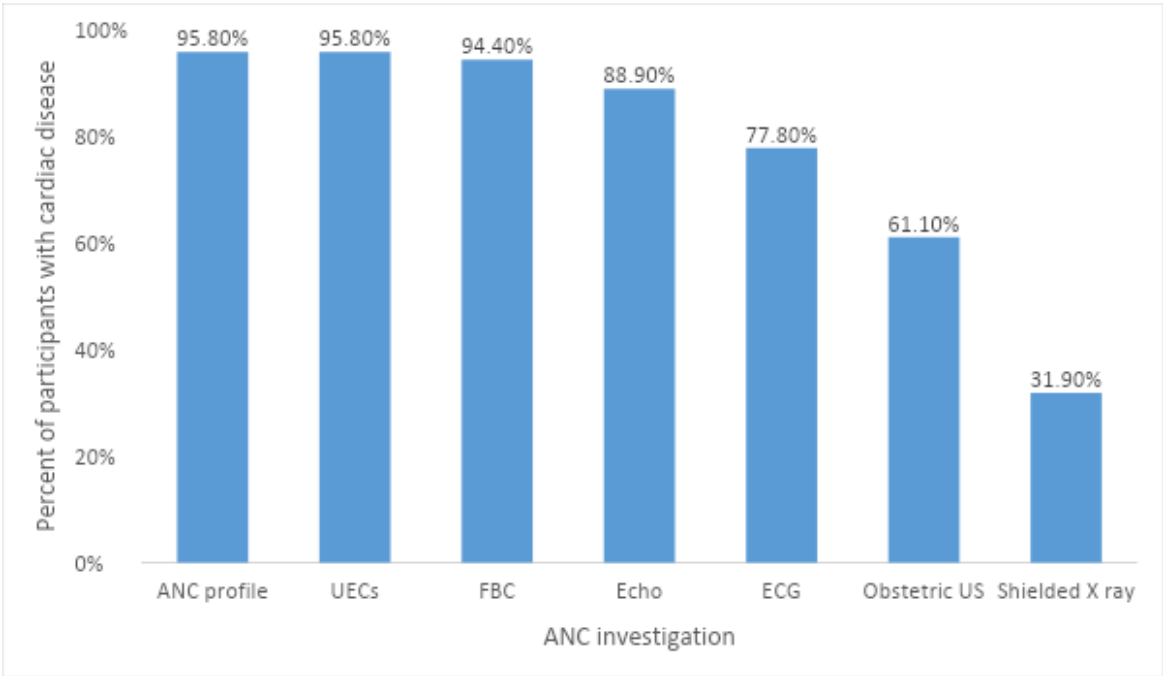
Most, 71 (98.6%) participants attended at least one ANC session with 29 (41.4%) participants attending 4 or more ANC sessions (Table 4). Seventy (97.2%) patients were referrals, and only 16 (22.2%) had an ANC cardiac review.

**Table 3: Preconception and Prenatal care provided to patients with cardiac disease in pregnancy at KNH(2013 - 2017**

	Frequency (n)	Percent (%)
<b>Preconception counselling</b>		
Not done	72	100
<b>ANC attendance</b>		
<b>Yes</b>	<b>71</b>	<b>98.6</b>
No	1	1.4
<b>No of ANC sessions attended</b>		
<b>Less than 4 ANC sessions</b>	<b>41</b>	<b>58.6</b>
4 or more ANC sessions	29	41.4
<b>Referral</b>		
<b>Yes</b>	<b>70</b>	<b>97.2</b>
No	2	2.8
<b>Gestation at referral in weeks</b>		
Mean, SD*	31.8	7.8
Median, IQR*	34	29-38
<b>ANC cardiac review</b>		
Yes	16	22.2
<b>No</b>	<b>56</b>	<b>77.8</b>
<b>Medical treatment before</b>		
Yes	34	47.2
No	38	52.8
<b>Medical treatment after</b>		
Yes	70	97.2
No	2	2.8
<b>Multidisciplinary conference</b>		
<b>No</b>	<b>72</b>	<b>100</b>
<b>Other medical specialists' reviews</b>		
<b>Yes</b>	<b>6</b>	<b>8.3</b>
No	66	91.7



**Figure 1: Requisite ANC investigations done in patients with cardiac disease in pregnancy in KNH**



The ANC (antenatal profile) is a group of basic screening test done which include, Full Blood count or Hb levels, Urinalysis, Blood grouping and rhesus factor, VDRL, HIV test. Random blood sugar and Hepatitis B surface antigen are included in some facilities.

The ANC profile for the sampled file was as demonstrated above.

**Table 4:ANC cardiac review and other medical specialist reviews of patients with cardiac disease during ANC period**

	Review done	
	Yes (n), (percentage)	No (n), (Percentage)
<b>Cardiologist review</b>		
Antenatal	<b>16, (22.2%)</b>	<b>56, (77.8%)</b>
Post-natal	<b>51, (70.9%)</b>	<b>21, (29.2%)</b>
Joint multi-disciplinary conference	<b>0</b>	<b>72, (100%)</b>
<b>Other specialist review</b>	<b>7, (9.7%)</b>	

\*Other Specialist - Ophthalmologist, General physician, renal physician.

This table describes the number of patients who received a cardiologist’s review in the antepartum, postnatal periods. It also describes the lack of joint multi-disciplinary review between the cardiac team and the obstetrics team.

## Provision of adequate intrapartum care

**Table 5: The adequacy of intrapartum care**

	Frequency (n)	Percent (%)
<b>Type of delivery</b>		
Elective Caesarean Section	5	6.9
Emergency Caesarian Section	<b>19</b>	<b>26.4</b>
<b>Vaginal delivery</b>	<b>48</b>	<b>66.7</b>
<b>Gestation at delivery</b>		
<b>Term</b>	<b>42</b>	<b>58.3</b>
Pre term	30	41.7
<b>Oxytocin</b>		
<b>Given</b>	<b>41</b>	<b>56.9</b>
Not Given	31	43.1
<b>Lasix</b>		
<b>Given</b>	35	48.6
Not Given	37	51.4
<b>Oxygen</b>		
Given	12	16.7
<b>Not Given</b>	<b>60</b>	<b>83.3</b>
<b>Assisted Vaginal Delivery</b>		
Given	18	25
<b>Not Given</b>	<b>54</b>	<b>75</b>
<b>Opioid analgesics</b>		
Given	17	23.6
<b>Not Given</b>	<b>55</b>	<b>75.4</b>

\* AVD - Assisted Vaginal delivery

Table 5 describes the intrapartum care given to patients with cardiac disease in pregnancy at Kenyatta National Hospital between 2013 – 2017. This include gestation at the time of delivery, the type of delivery offered, whether or not critical interventions such as administration of Lasix, oxygen and opioid analgesia was given to the patients during delivery.

**Table 6: The adequacy of post-delivery care**

<b>Aspect of care</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<b>Pediatric review</b>		
Yes	25	34.7
<b>No</b>	<b>46</b>	<b>63.9</b>
<b>Stringent Monitoring of vital signs</b>		
<b>Yes</b>	<b>72</b>	<b>100</b>
No	0	0
<b>Monitoring change murmurs</b>		
Yes	11	15.3
<b>No</b>	<b>61</b>	<b>84.7</b>
<b>Cardiologist review</b>		
<b>Yes</b>	<b>58</b>	<b>80.6</b>
No	14	19.4
<b>Follow up plan</b>		
<b>Yes</b>	<b>71</b>	<b>98.6</b>
No	1	1.4
<b>Specific date for follow up</b>		
<b>Yes</b>	<b>69</b>	<b>95.8</b>
No	3	4.2
<b>Education on danger signs</b>		
Yes	16	22.2
<b>No</b>	<b>55</b>	<b>76.4</b>

Table 6 describes the immediate postnatal care offered to patients with cardiac disease in pregnancy at Kenyatta National Hospital between 2013 – 2017. This includes monitoring of vital signs, cardiologist review postpartum, patient education and follow up plan at the time of discharge.

### 3.15 DISCUSSION

Cardiac disease in pregnancy is an increasing cause of indirect maternal mortality globally (3). The number of women with either acquired or congenital heart disease has increased as the modes of treatment for childhood heart disease has improved with time (15,16).

Cardiac disease in pregnancy affects approximately 0.2 to 4% of pregnancies globally (2,18).

In this study, 73 files out of 237 files that had been selected fulfilled the criteria for the study. The attrition was attributed mainly to wrong coding of files at the registry, lower gestation than that in the inclusion criteria and those who started the ANC visits at KNH but delivered elsewhere hence their intra and postpartum care data was unavailable.

The mean age of the participants was 29.6 years. Most 50(69.4%) of the participants were married, 28(38.9%) had attained at least secondary education and 35(48.6%) resided in peri-urban areas (48.6%). About 76.4 % of the participants were multigravida

The preponderant cardiac lesion was rheumatic heart disease at 90%. Congenital heart disease accounted for 5.6% while hypertensive heart disease was 4.2 %. The mean duration of illness was 5.3 years. This is comparable to a study done in Durban South Africa which showed that a majority of cardiac disease in pregnancy was caused by rheumatic heart disease in 81% ( n= 95) of the study population (31). This was also the finding in a study done in western Kenya where the prevalence of rheumatic heart disease was 71% ( n=97)(11). Out of the 72 patients with cardiac disease in pregnancy 55(76.4%) were multigravida.

The commonest NYHA classifications were NYHA IV in 19(26.4%) participants and NYHA III in 12 (16.7%) participants. NYHA classification was not documented in 43(59.7%) patients. This points to the severity of the condition of the patients who are referred to KNH. This is comparable to the studies done in Dakar Senegal and Durban South Africa by (24,32).

Most of the patients, 70 (97.2%), were referrals from other facilities which is an indication of poor resources from the referring facilities.

95.8% of the patient had an ANC profile which is impressive. This could be attributed to the ANC profile being a prerequisite for booking into an ANC clinic at KNH and admission in the obstetric wards. It's also an indication of good general history taking by the doctors and

midwives who attend to these patients. 95.8% and 94.4% of patients had a full blood count and UECs done respectively. This is also a good indication of the investigative capacity of KNH as a referral facility. On radiological investigations, 88.9% had an ECHO, 77.8% had an ECG and only 61.3% had an obstetric ultrasound done. This requires improvement as all patients with cardiac disease in pregnancy need to have the above-mentioned radiological investigation done as part of comprehensive care. None of the articles reviewed for literature review had assessed for this aspect of care.

Multidisciplinary approach in management of patients with cardiac disease in pregnancy is paramount in ensuring that good maternal and fetal outcomes are achieved. (33).

This study found that there is a lack of adequate antenatal reviews by the cardiology team for patients with cardiac disease in pregnancy who have been admitted in KNH. In 79.2% (n= 57) of patients records reviewed, there was no documented evidence of a review in the antenatal period by the cardiology team.

However, there was a marked improvement in the postnatal period where 80.9% (n- 58) of the patient's records showed evidence of cardiologist review. Multi-disciplinary conference for patients with cardiac disease in pregnancy was not done in all the patients whose records were reviewed in this study n=73 (100%) Table 4. The aspect of multidisciplinary conference with patients is emphasized in a study done by Mayer et al (33) as being integral in ensuring patient compliance and co-operation during treatment. It also greatly enhances communication between the medical team and the patients which is likely to improve outcomes and satisfaction of the health care provided.

The mode of delivery for most patients with cardiac disease in pregnancy at Kenyatta National Hospital was vaginal delivery (66.7% ,n=48). Deliveries via Caesarean section were mainly due to obstetric indications which were well documented in the patients' records. Assisted vaginal delivery was offered to (25% ,n=18) of the patients who delivered at term (58%, n= 42). In a study done in Dakar Senegal by Diao et al, the mode of delivery in the majority of patients was SVD, ( 63%,n=19), (32). This result differs with the findings in a study done in South Africa where 57% of the patients with cardiac disease in pregnancy were delivered via Caesarean Section, (31). Assisted vaginal delivery is the recommended mode of delivery in the management of labor in cardiac disease in pregnancy. This however depends on the severity of

the cardiac lesion and the weighted risk of assisted vaginal delivery use versus the benefits, (28). The gestation at delivery for a majority of the patients 42(58.3%) was at term. This is consistent with findings from a study by Nqayana et al in Pretoria south Africa where 60 out of 95 patients sampled were delivered at term. (31)

There was good monitoring of vital signs of patients with cardiac disease in pregnancy in the postpartum period. There was evidence of documentation in the records of the patients' files that were sampled for this study. This could be attributed to the fact that, patients with cardiac disease in pregnancy are nursed in the acute room of the hospital's labor ward where the nurse to patient ratio is generally low at 1 nurse for 5 - 6 patients at most times.

Documentation of follow up plans for patients with cardiac disease in pregnancy was well done as almost all records sampled in this study found a follow up plan with a specific period of return. There was however no documentation of education on danger signs for both the mothers and their neonates upon discharge from the hospital. Mayer et al assessed for follow up of patients with cardiac disease in pregnancy and found that there was limited documented evidence of women being in receipt of individualized postnatal care plans (34).

### **3.16 CONCLUSION.**

None of our study participants files had evidence of documented preconception care.

There is gross lack of interdisciplinary care for patients with cardiac disease in pregnancy at Kenyatta National Hospital. The management of labor for patients with cardiac disease in pregnancy at KNH is also substandard.

Postnatal care of patients with cardiac disease at KNH is good but improvement is needed in documentation of postpartum follow-up plans and education on danger signs.

### **3.17 RECOMMENDATION**

1. Encourage patients with known cardiac disease in cardiology clinic at KNH, who are of child bearing age, to seek preconception care.
2. Liaise with the cardiology department to implement referrals for preconception care for patients of childbearing age with cardiac disease.

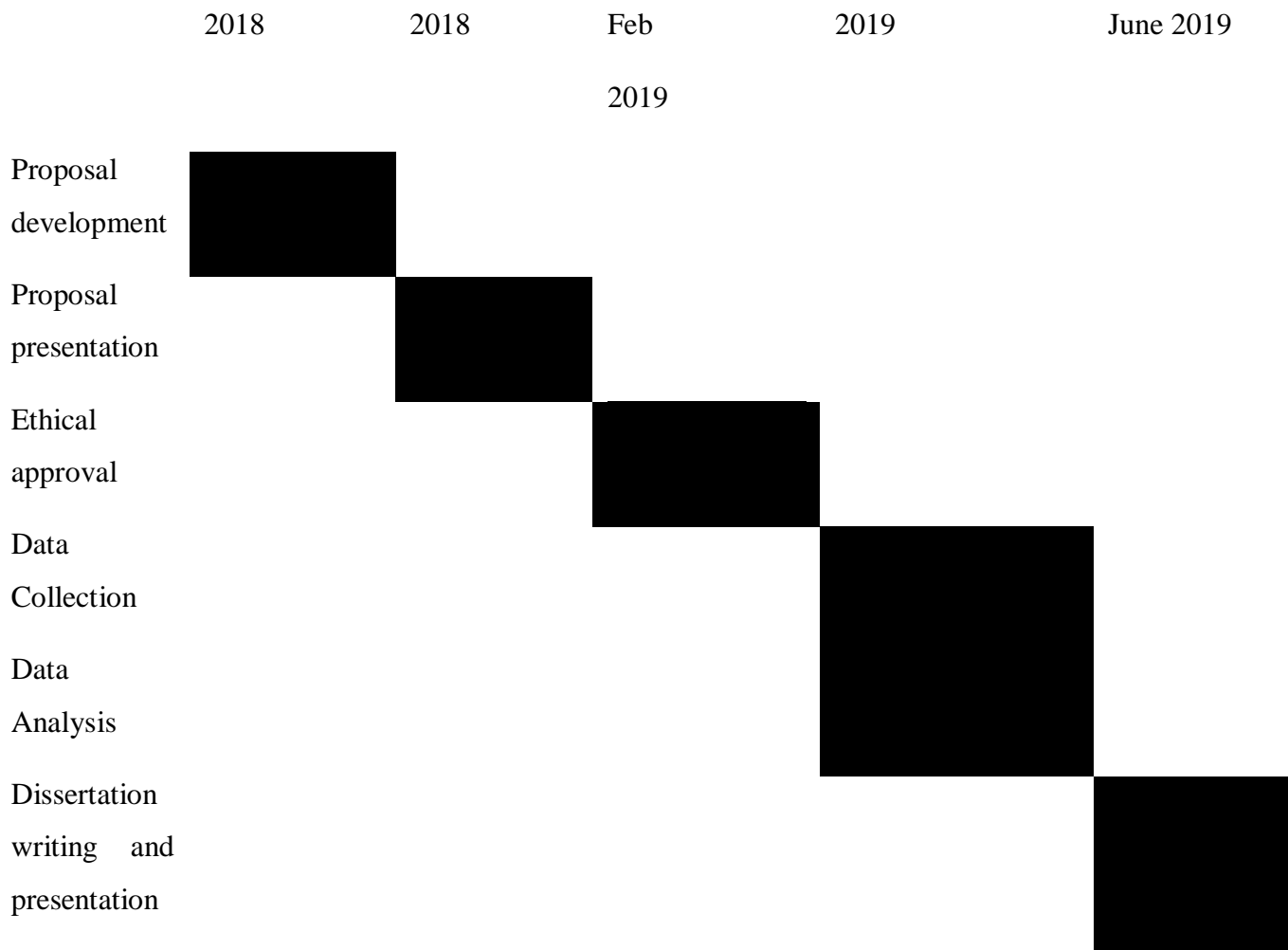
3. Ensure that interdisciplinary management of patients with cardiac disease is implemented throughout pregnancy and post delivery period.
4. More research is required in this field to assess the relationship between quality of care and outcomes and to encourage continued evaluation of care and its impact on outcomes

## **APPENDICES**

### **Appendix I: Study Time Frame**

ACTIVITY	Jan – July	Aug	Sept 2018	-	Mar2019	-	May	May 2019-
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## Appendix II: Study Budget

Item	Unit of Measure	Duration/ Number	Unit Cost (Kshs)	Total Cost (Kshs)
Personnel				
<b>Research Assistant</b>	<b>2</b>		<b>20,000</b>	<b>40,000</b>
<b>Statistician</b>	<b>1</b>	<b>1</b>	<b>40,000</b>	<b>40,000</b>
<b>Participants</b>	-	-	-	-
<b>Transcribing Fee</b>	-	-	-	-
Printing				
<b>Consent Form</b>	-	-	-	-
<b>Assent Form</b>	-	-	-	-
<b>Questionnaires</b>	<b>1</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>Interview Guide</b>	-	-	-	-
<b>Final Report</b>	<b>6</b>	<b>50</b>	<b>10</b>	<b>3000</b>
Photocopying				
<b>Consent Form</b>	-	-	-	-
<b>Assent Form</b>	-	-	-	-
<b>Questionnaires</b>	<b>200</b>	<b>3</b>	<b>3</b>	<b>1800</b>
<b>Interview Guide</b>	-	-	-	-
<b>Final Report</b>	<b>80pages</b>	<b>1</b>	<b>10</b>	<b>800</b>
<b>Final Report Binding</b>	<b>80 pages</b>	<b>3</b>	<b>500</b>	<b>1500</b>
Other costs				
<b>ERC Fees</b>	<b>2000</b>	<b>1</b>	<b>1</b>	<b>2000</b>
<b>Records Access Fee</b>	<b>1500</b>	<b>1</b>	<b>1</b>	<b>1500</b>
<b>Box files</b>	<b>1</b>	<b>1</b>	<b>220</b>	<b>220</b>
<b>Note books</b>	<b>3</b>	<b>1</b>	<b>50</b>	<b>150</b>
<b>Pens</b>	<b>10</b>		<b>20</b>	<b>200</b>
<b>Total</b>				<b>Ksh104,370.00</b>

The study was funded by KNH research and programs fund.

### Appendix III: Dummy Tables.

**Table 1: Sociodemographic data**

#### Socio demographic data analysis

	(No.)	Percent(%)
Age		
<20 years		
20 – 30 years		
30 – 40 years		
> 40 years		
Level of education		
Primary		
Secondary		
Tertiary		
Not indicated		
Residence		
Urban		
Peri -urban		
Rural		
Marital status		
Single		
Married		
Divorces		

**Dummy table 1 – Provision of preconception care to patients with known cardiac disease.**

	Yes	No
Risk scoring		
Contraception counselling		
Physical cardiac evaluation		

**Dummy table 2 – Provision of objective prenatal care**

		(No.)	Percent (%)
Parity			
	Multiparous		
	Primigravida		
ANC attendance			
	Yes		
	No		
Referral			
	Yes		
	No		
Gestation at referral			
	< 28weeks		
	28 – 36 weeks		
	>36weeks		
Cardiac evaluation( Documented evaluation by cardiologist antenatal)			
	Yes		
	No		
Multidisciplinary conference with patients( Documented)			
	Yes		
	No		
NYHA Classification			
	1		
	2		
	3		
	4		
	Not documented		
Type of cardiac lesion			
	RHD		
	HHD		
	Congenital		
Duration of illness			
	< 9months		
	>9months		
	Not indicated		

**Dummy table 3 - Investigations done**

		(No)	Percent (%)
<i>LABORATORY</i>			
FHG	Yes		
	No		
UEC	Yes		
	No		
ANC	Yes		
	No		
<i>RADIOLOGY</i>			
ECG	Yes		
	No		
ECHO	Yes		
	No		
SHIELDED CHEST XRAY	Yes		
	No		
OBS U/S	Yes		
	No		

**Dummy table 4 – Provision of adequate intrapartum care**

		(No)	Percent (%)
Mode of delivery			
Vaginal			
Caesarian section			
Elective CS			
Emergency CS			
<i>Documented provision of -:</i>			
Oxygen	Yes		
	No		
Lasix	Yes		
	No		
Oxygen	Yes		
	No		
Analgesia	Yes		
	No		
Assisted vaginal delivery	Yes		
	No		
Neonatal review			

Yes		
No		

**Dummy table 5 - Adequacy of post-delivery care**

		(No.)	Percent (%)
<i>Early post-partum</i>	Yes		
	No		
Monitoring of vital signs	Yes		
	No		
Monitoring changes in murmurs	Yes		
	No		
Review by cardiologist	Yes		
	No		
<i>Follow up</i>	Yes		
	No		
Follow up plan	Yes		
	No		
Specified date of return	Yes		
	No		
Education on danger signs	Yes		
	No		

## **Appendix IV: Request for Consent**

HEAD OF CLINICAL SERVICES  
KENYATTA NATIONAL HOSPITAL  
P.O BOX

THROUGH  
HEAD OF RECORDS DEPARTMENT  
KENYATTA NATIONAL HOSPITAL

DATE 28<sup>TH</sup> AUGUST 2018

DEAR SIR,

REF: REQUEST TO ACCESS PATIENTS FILES

My name is Dr. Wanjiku Grace Njoki, admission number H58/80979/2015, a post graduate student in the department of obstetrics and gynaecology at the University of Nairobi.

I am conducting a retrospective descriptive cohort study on evaluation of management of cardiac disease in pregnancy at Kenyatta National Hospital.

This is to kindly request access and collect data from patient's files in the records department, as this will be a retrospective study.

I look forward to your favorable response

Thank you in advance

Yours truly,

Dr. Wanjiku Grace N.

**Appendix V: DATA EXTRACTION TOOL**

UNIQUE NUMBER \_\_\_\_\_

**SOCIODEMOGRAPHIC DATA.**

- a) Age in completed years  < 20yrs  20 -30 yrs.  30-40 yrs.  >40yrs
- b) level of education Primary  Secondary  Tertiary
- c) Residence Urban  Peri-urban  Rural
- d) Marital Status Single  Married  Divorced

**Preconception Care**

**Remarks**

Risk Scoring	YES <input type="checkbox"/>	NO <input type="checkbox"/>	
<hr/>			
Contraception Counselling	YES <input type="checkbox"/>	NO <input type="checkbox"/>	<hr/>
Physical Cardiac evaluation	YES <input type="checkbox"/>	NO <input type="checkbox"/>	

**1. OBSTETRIC FACTORS**

- a) Parity
- b) Preconception counselling(documented) Done [  ] Not Done [  ]
- c) ANC attendance YES [  ] No [  ]
- d) Number of ANC visits \_\_\_\_\_
- e) Medical treatments ( Drugs)
  - i. Before pregnancy \_\_\_\_\_
  - ii. During pregnancy \_\_\_\_\_
- f) Was the patient referred YES  NO 

If yes comment on gestation at referral \_\_\_\_\_
- g) No. of visits by Cardiologist/Physician( Documentation) \_\_\_\_\_
- h) Evidence(documentation) of multidisciplinary conference with patient \_\_\_\_\_
- i) Any other medical specialist visit (specify specialist) \_\_\_\_\_
  - a. If yes to above state indication \_\_\_\_\_
- j) Type of delivery \_\_\_\_\_
- k) Gestation at delivery(documented rationalization of mode of delivery) Yes [  ] No [  ]
- l) Outcome of the delivery \_\_\_\_\_



Test done.

i. LABORATORY TESTS

	YES		NO	REMARKS (N, Abn)
❖ ANC profile	[ ]	]	[ ]	_____
❖ FHG	[ ]	]	[ ]	_____
❖ UECr	[ ]	]	[ ]	_____
ii. IMAGING TESTS				
❖ ECG	[ ]	]	[ ]	_____
❖ Echocardiogram	[ ]	]	[ ]	_____
❖ Shielded CXR	[ ]	]	[ ]	_____

2. Medical history

a. Type of cardiac lesion

- i. Congenital [ ]
- ii. Acquired ( Rheumatic heart disease) [ ]

b. Duration of diagnosis ( Illness)    Years     Months

c. History of Previous cardiology Interventions    Yes     No

d. Type of intervention \_\_\_\_\_

3. Intrapartum care

a. Mode of delivery    Vaginal delivery     Caesarian section

b. If caesarian , note the indication \_\_\_\_\_

c. Documented use of

i. Oxytocin    YES     NO

ii. Oxygen    YES     NO

iii. Analgesia(Morpine)    YES     NO

iv. Assisted vaginal delivery(in SVD) YES     NO

v. Neonatologist review( for the neonate) YES     NO

4. Postpartum care

a. Early post-partum

Documented

- i. monitoring of vital signs      YES       NO
- ii. monitoring of change in murmurs      YES       NO
- iii. review by cardiologist/physician      YES       NO
- iv. Documented follow up plan      YES       NO

b. Follow up

Documented

- i. Follow up plan      YES       NO
- ii. Specified date of return      YES       NO
- iii. Education on danger signs      YES       NO

## **Appendix VI: Adopted guidelines**

### **Good practice 13 by RCOG and Kenya National Guidelines on management of cardiovascular disease, May 2018)**

*8.1.1.1 Royal College of Obstetricians and Gynaecologists, Good Practice no 13, June 2013*

Cardiac Disease and Pregnancy

#### 1. Purpose

Cardiac disease is a leading cause of maternal death in pregnancy in many developed countries, including the UK. However, there is a lack of evidence-based guidelines to assist in planning the management of affected pregnancies. The purpose of this Good Practice guidance is to provide a summary of current expert opinion as an interim measure, with the hope that these opinions will be supplemented by objective evidence in due course.

#### 2. Introduction.

In the UK, the Confidential Enquiries into Maternal Deaths (CEMACH) have shown that the overall rate of mortality from cardiac disease has risen from 7.3/million births in the 1982–84 triennium<sup>1</sup> to 22.7/million births in the 2003–05 triennium.<sup>2</sup> The major part of this increase is attributable to acquired heart disease, deaths from which have risen from 4.7/million births to 20.8/million births. One-third of these deaths are a result of myocardial infarction/ischaemic heart disease and a similar number of late deaths are associated with peripartum cardiomyopathy. Other significant contributors (5–10% each) are rheumatic heart disease, congenital heart disease and pulmonary hypertension. With the current increase in older mothers, obesity, immigration and survival of babies operated on for congenital heart disease, the need to identify women at risk of heart disease and to plan their careful management will also inevitably increase.

The suggestions in this Good Practice guidance are based upon the recommendations of a consensus group convened at the Royal College of Obstetricians and Gynaecologists in 2006, which are published in full by the RCOG Press,<sup>3</sup> and those in the CEMACH report *Saving Mothers' Lives: Reviewing Maternal Deaths to Make Motherhood Safer 2003–2005*.<sup>2</sup>

#### 3. Risk assessment, preconception counselling and management planning 3.1 Myocardial infarction, ischaemic heart disease, and aortic dissection

Pregnancy itself raises the risk of acute myocardial infarction by three- to four-fold, with the risk being 30 times higher for women over the age of 40 years compared with women aged less than 20 years. As reported by CEMACH, in the 2003–05 triennium<sup>2</sup> the rate of maternal death from ischaemic heart disease in the UK had risen to 1/132,000 pregnancies (up from 1/252,000 in 2000–2002).<sup>4</sup> Other risk factors include chronic hypertension, pre-eclampsia, diabetes, smoking, obesity and hyperlipidaemia. Up to 1/13 women with a myocardial infarction in pregnancy will die. Unfortunately, many of these risk factors are becoming increasingly common, and most women affected will be asymptomatic before pregnancy, with no history of heart disease. The key component of good management is therefore a high index of suspicion for myocardial infarction in any pregnant woman presenting with chest pain. The possibility of aortic dissection should also be considered. All women with chest pain in pregnancy should have an electrocardiogram interpreted by someone who is skilled at detecting signs of cardiac ischemia and infarction and, if the pain is severe, they should have computerized tomography or a magnetic resonance imaging scan of the chest. A serum troponin I measurement can also be useful.

### 3.2 Per partum cardiomyopathy

The cause of peripartum cardiomyopathy is unknown in most cases. It usually presents in late pregnancy or early in the puerperium, but it can occur up to 6 months after delivery. Peripartum cardiomyopathy should be considered in any pregnant or puerperal woman who complains of increasing shortness of breath, especially on lying flat or at night. As 25% of affected women will be hypertensive, it can be confused with pre-eclampsia. All such women should have an electrocardiogram, a chest X-ray and an echocardiogram.

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### 3.3 Rheumatic heart disease

Almost 25% women currently giving birth in the UK were not themselves born in the UK; the figure rises to more than 50% in London. Many of these women will never have undergone medical screening and some will be unaware that they have valvular heart disease. This highlights the need for a particularly careful cardiovascular assessment at the beginning of

pregnancy of all women not born in a country where there is effective medical screening in childhood, including auscultation of the heart. Mitral valve stenosis (the most common lesion and the one that carries the highest risk) is a difficult clinical diagnosis and there should be a low threshold for echocardiography.

### 3.4 Aortic dissection

Systolic hypertension was a key factor in most of the deaths from aortic dissection, and this emphasizes the importance of blood pressure monitoring during pregnancy and prompt antihypertensive therapy if blood pressure becomes elevated. Aortic dissection (diagnosed by computed tomography scan) is the most common serious complication of Marfan syndrome.

### 3.5 Congenital heart disease

Although deaths from congenital heart disease are fortunately uncommon, the prevalence of this condition in pregnancy is about 0.8%. Congenital heart disease is one of the most common congenital abnormalities and the majority of those affected will survive to adulthood, in large part because of the development of effective corrective/palliative surgery over the last 30 years.

### 3.6 General principles of management

**3.6.1 Preconception** Girls with congenital heart disease should be referred to a joint cardiac/obstetric/gynaecological clinic for advice about contraception (and subsequently for preconception counselling) once puberty is under way (commonly at the age of 12–15 years). Preconception counselling should also be offered to older women with a new diagnosis. Because pregnancy carries substantially increased risks for women with congenital heart disease, particular efforts should be made to prevent unwanted pregnancy. Appendix A describes appropriate types of contraception for women with the different types of congenital lesion.

Women should be given an outline of the issues relating to pregnancy with congenital heart disease at the first visit to the joint clinic, and then be reviewed with more detailed information once they are considering conception. Topics that should be covered at this detailed review include the increased risk of mortality, congenital heart disease in the offspring and the need for increased medical surveillance during pregnancy. A sample patient information leaflet on congenital heart disease and pregnancy is available in Appendix B. Appendix C describes what

to look out for in the symptomatic women. Appendix D describes the typical patient journey of a pregnant woman with heart disease.

3.6.2 Antepartum Because there are so many types of cardiac disease, often with very different implications, it is important that a risk assessment of any woman with a heart murmur or a history of any cardiac defect should be carried out early in pregnancy in a joint clinic attended by a consultant obstetrician, cardiologist and anaesthetist. All of these professionals should have appropriate experience. Women at low risk can be identified and returned to routine care. Women at significant risk of adverse events during pregnancy should be seen regularly in the antenatal clinic, whenever possible by the same consultant obstetrician, who should have appropriate competencies in this field. When that consultant is away on leave, there should be a competent deputy. Use of the structured antenatal notes makes continuity of care easier to achieve. Cardiovascular assessment should be carried out at every antenatal clinic. Blood pressure should be measured manually with a sphygmomanometer according to the recommendations of the British Hypertension Society (<http://www.abdn.ac.uk/medical/bhs/>). Measurement of pulse rate and rhythm is also mandatory as it may be the first sign of volume overload. Auscultation to assess any change in murmur or any lung changes associated with pulmonary oedema is recommended in all cases of significant cardiac compromise (which will have been identified early in pregnancy at the joint clinic). Women with cyanotic heart disease should have their oxygen saturations checked periodically (each trimester or more often if there are any clinical signs of deterioration). A template for adapting normal antenatal records for use in women with heart disease is available in Appendix E.

All women with structural congenital heart disease should be offered a fetal echocardiogram during the second trimester to be carried out by an accredited paediatric/fetal cardiologist (as distinct from the standard four-chamber view offered to all women as part of routine antenatal screening and carried out by accredited ultra-sonographers and fetal medicine specialists).

A further multidisciplinary meeting should take place at 32–34 weeks of gestation to establish a plan of management for delivery. Important features of such a plan include deciding who should be involved in supervising the labour, whether a caesarean section is appropriate, whether bearing down is advisable in the second stage and appropriate prophylaxis against postpartum haemorrhage (routinely used oxytocic regimes can have major cardiovascular adverse effects; a

low-dose syntocinon infusion is probably the safest option, and at caesarean section prophylactic uterine compression sutures can be considered instead of oxytocics). The plan should also include postpartum management, including whether prophylaxis against thrombosis is appropriate, the length of postpartum stay in hospital and the timing of cardiac and obstetric review. A template for such planning is provided in Appendix F.

3.6.3 Intrapartum The general principle of intrapartum management is to minimise cardiovascular stress. In most cases this will be achieved by the use of early slow incremental epidural anaesthesia and assisted vaginal delivery. Caesarean section is usually necessary only for obstetric indications.

Some women will benefit from specialist care at tertiary units. The decision about the optimum place for antenatal and intrapartum care should be made in conjunction with obstetricians and cardiologists at tertiary units known to specialise in the management of women with heart disease in pregnancy. Appropriate tertiary units will have high-dependency and intensive care units suitable for the care of pregnant women with significant heart disease.

3.6.4 Postpartum The length of recommended stay in hospital and any suggested special measures (such as anticoagulation, or observation in a high-dependency area) should be specified in advance, so that midwifery/resident medical staff do not have to seek urgent guidance out of hours. The timing of follow-up at the joint clinic should also be specified. Appropriate advice about contraception should also be given.

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## KENYA NATIONAL GUIDELINES FOR CARDIOVASCULAR DISEASE MANAGEMENT.

Division of Non-communicable disease, Ministry of Health.

### Cardiovascular diseases in Pregnancy

#### 15:1 Introduction

Presently, 1-4% of pregnancies are complicated by cardiovascular disease. This is associated with significant morbidity and mortality, both for the mother and the fetus.

**Hemodynamic and Metabolic Changes in Pregnancy** During pregnancy, the maternal circulation undergoes physiological changes to meet the increased metabolic demands of the mother and fetus. They include increases in blood volume and cardiac output (CO), and reductions in systemic vascular resistance and blood pressure (BP). Plasma volume reaches a maximum of 40% above baseline at 24 weeks gestation. A 30–50% increase in CO occurs in normal pregnancy. CO increases by 15% in early labour, by 25% during 1st stage, and by 50% during 2nd stage. It reaches an increase of 80% early post-partum due to autotransfusion associated with contraction and involution of the uterus, and resorption of oedema in the lower limbs. This increased stress on the heart can cause significant deterioration of heart function where there is already disease, or cause symptoms in previously undiagnosed CVD. Other factors that cause hemodynamic changes are uterine contractions, positioning (left lateral vs. supine), pain, anxiety, exertion, bleeding, anaesthesia and infection.

Blood pressure (BP) typically falls early in gestation and diastolic BP (DBP) is usually 10 mmHg below baseline in the second trimester. This decrease in BP is caused by active vasodilatation. In the third trimester, the DBP gradually increases and may normalize to non-pregnant values by term. In view of this, serialized blood pressure measurements provide the best opportunity to pick up a rising trend in BP, even when not overtly elevated above the traditional 140/90 mmHg. Pregnancy causes a hyper-coagulable state, resulting in an increased risk of thrombo-embolic events. There is an increase in the concentration of coagulation factors such as fibrinogen, and platelet adhesiveness, as well as a reduction in fibrinolysis. In addition, the



enlarging uterus causes obstruction to venous return, resulting in stasis and a further rise in risk of thrombo-embolism.

Maternal glucose homeostasis may change and cholesterol levels increase in adaptation to fetal–maternal needs. Increased levels of anti-insulin hormones peak at 24-28 weeks gestation. This may result in maternal hyperglycemia that results in poor fetal and maternal outcomes.

Cardiovascular diseases in pregnancy include: 1. Hypertensive disorders of pregnancy 2. Cardiac disease in pregnancy 3. Venous Thromboembolism

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Cardiovascular diseases in Pregnancy |

#### 15:2 General Reproductive Health Considerations in Cardiovascular Disease

Preconception Care: Girls with congenital heart disease should be referred to a facility where they can access both cardiac and obstetric care, once in puberty (Age 12-15). Newly diagnosed older women should also be referred for the same. Counseling offered should include information on increased cardiovascular risk in pregnancy, contraceptive options, risk to the fetus especially with congenital lesions and increased need for surveillance in pregnancy.

Antepartum: Because of the diversity in cardiovascular disease, often with differing implications, it is important that a risk assessment of any woman with a heart murmur or a history of any cardiac defect or vascular disease be carried out early in pregnancy. They should be reviewed jointly by a cardiologist and an obstetrician. Women at low risk can be identified and returned to routine care. Women at significant risk of adverse events during pregnancy should be seen regularly in the antenatal clinic, whenever possible by the same obstetrician. Cardiovascular assessment should be carried out at every antenatal clinic visit. This should include:

- Blood pressure measurement
- Measurement of pulse rate and rhythm is also mandatory as it may be the first sign of volume overload
- Auscultation to assess any change in murmur or any lung changes associated with pulmonary oedema
- Women with cyanotic heart disease should have their oxygen saturations checked periodically (each trimester or more often if there are any clinical signs of deterioration).
- All women with congenital heart disease should be offered a fetal echocardiogram during the second trimester to be carried out by fetal cardiologist (as distinct from the standard four-chamber view offered to all women as part of routine antenatal

screening • A multidisciplinary meeting (obstetrics, cardiology, neonatology, anaesthesia) should take place at 32–34 weeks of gestation to establish a plan of management for delivery

Intrapartum: The general principle of intrapartum management is to minimise cardiovascular stress. This is achieved by providing adequate analgesia/anaesthesia and shortening 2nd stage of labour by performing an assisted vaginal delivery. Caesarean section is done for obstetric indications. High risk patients should deliver in level 6 facilities which have high-dependency and intensive care units, suitable for the care of pregnant women with significant heart disease. For more details, please refer to session 3 (page 126) of complications/conditions during antenatal period in the National Guidelines on Quality Obstetrics and Perinatal Care.

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Postpartum: For patients with cardiac lesions the standard bolus IM dose of 10IU units of oxytocin for active management of 3rd stage of labour SHOULD NOT be given. Instead uterine massage, and a low dose infusion with limited fluids should be given. The postpartum period is associated with a high level of complications due to the increased cardiac output. These patients should therefore remain in hospital for at least 10 days' post-partum for monitoring. 15:3  
Hypertensive disorders in pregnancy

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